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Technical Memorandum

MONROE COUNTY COMPREHENSIVE PLAN
HURRICANE EVACUATION ANALYSIS

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Hurricane Evacuation Analysis

Recognizing the importance of consistency with previous hurricane evacuation study efforts performed for Monroe County, Barton-Aschman Associates, Inc. retained Post, Buckley, Schuh, and Jernigan, Inc. to perform a hurricane evacuation analysis to support the comprehensive planning work being performed by Wallace, Roberts, and Todd and Barton-Aschman for Monroe County.

The analysis looked at existing development levels (as indicated by the 1990 Census) versus Monroe County's only evacuation routes, US 1 and Card Sound Road. Scenarios tested in the analysis addressed two levels of seasonal occupancy, a forty percent diversion of US 1 evacuation traffic to Card Sound Road, and several widened US 1 alternatives which are summarized as follows:

Road Segment	Number of Outbound Travel Lanes				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
US 1 (18 mile stretch)	2	2	2	2	2
Card Sound Road	1	1	1	1	1
US 1 (MM80-MM90)	1	2	2	2	2
US 1 (MM73-MM80)	1	1	2	2	2
US 1 (MM54-MM73)	1	1	1	2	2
US 1 (MM4-MM54)	1	1	1	1	2

The hurricane evacuation analysis used the same behavioral parameters developed in the 1989 US Army Corps of Engineers study, but incorporated the 1990 Census data and recent roadway improvements as well as the latest FDOT traffic count/ characteristic data.

Two major outputs of the hurricane analysis performed for the comprehensive planning effort included the identification of the most congested roadway segment and clearance times by scenario. The controlling roadway segment for an evacuation is the 18 mile stretch of US 1 out of the Keys. If this segment is four laned or 40% of evacuation traffic diverted to Card Sound Road, the controlling segment shifts to US 1 from Milemaker 80 to Milemaker 90. If this segment is four laned, the controlling segment shifts to US 1 from milemarker 100 to Milemarker 106 which is already four laned.

Clearance times range from 22¼ to 35 hours for the baseline seasonal occupancy situation depending on the use of Card Sound Road and depending on assumed US 1 widening alternatives. Clearance times range from 24 to 37¾ hours for the increased population seasonal occupancy situation depending upon the same variables.

MONROE COUNTY COMPREHENSIVE PLAN
Hurricane Evacuation Analysis

INTRODUCTION

A critical element to the development of the Monroe County Comprehensive Plan is the analysis of hurricane evacuation clearance times for the existing land development in the Florida Keys versus the existing road network. The consideration of evacuation time related to hurricanes is not a new issue for Monroe County. A great deal of related work has been accomplished over the past decade by public agencies such as Monroe County Civil Defense, FEMA, the U.S. Army Corps of Engineers, and the Florida Department of Community Affairs, Division of Emergency Preparedness.

Most recently, the US Army Corps of Engineers, Jacksonville District, retained Post, Buckley, Schuh & Jernigan, Inc. to perform the necessary transportation analysis to quantify evacuation travel movements and clearance times for use in its regional hurricane evacuation study. This 1989 work effort was based on estimates of storm vulnerability, behavioral response, and permanent and seasonal socioeconomic data for each sub-area of the keys. The effort was closely coordinated with Monroe County emergency management (civil defense) staff since the results would be used by them to update local response plans.

PBS&J's approach to developing clearance times in the 1989 study recognized that the magnitude of evacuating vehicles varies depending upon the intensity of a hurricane, presence of tourists, and certain behavioral response and participation characteristics of the vulnerable population. Vehicles enter the road network at different times depending on the evacuees' response relative to an evacuation order or advisory. Conversely, vehicles leave the road network depending on both the planned destinations of evacuees and the availability of acceptable destinations such as public shelters, hotel/motel units and friends' or relatives' homes in non-flooded areas. Vehicles move across the road network from trip origin to destination at a speed dependent on the traffic loadings on various roadway segments and the ability of the segments to handle a certain volume of vehicles each hour.

The PBS&J approach defined clearance time as the time it takes to clear Monroe County's roadways of all evacuating vehicles. Clearance time begins when the first evacuating vehicle enters the road network and ends when the last evacuating vehicle arrives at the entrance to the Homestead Extension of the Florida Turnpike. Clearance time is a value resulting from transportation engineering analysis performed under a specific set of assumptions. It must be coupled with pre-land-fall hazards data to determine when a strong evacuation advisory must be issued to allow evacuees time to reach safe shelter before the arrival of sustained tropical storm winds.

STUDY PURPOSE

Recognizing the importance of consistency with previous hurricane evacuation study efforts performed for Monroe County and obtaining the best hurricane evacuation transportation analysis expertise available, Barton-Aschman Associates, Inc. retained PBS&J to perform an updated analysis. The work would be incorporated into the overall comprehensive planning activity being performed by Wallace, Roberts, and Todd, and Barton-Aschman for Monroe County. Since the analysis results would likely be used to determine future development levels for Monroe County, it was felt that the 1989 study must be updated to best reflect the 1990 Census as well as recent roadway improvements. The update would also take advantage of recent roadway inventories and traffic count/characteristic data assembled by Barton-Aschman for its transportation planning work in the county. Finally, the update would rely extensively on detailed permanent and seasonal dwelling unit/population figures developed by Price-Waterhouse for each key from the 1990 Census and reliable local sources.

This technical memorandum was prepared to summarize major technical steps performed and evacuation data generated by each work task. Appendices are provided to support each described section.

ANALYSIS ACTIVITIES AND FINDINGS

The development of updated hurricane evacuation data focused on a combination of manual and computer-oriented modeling activities that involved the following steps:

1. Dwelling unit data compilation
2. Storm intensity selection and evacuation zone delineation
3. Behavioral analysis and trip generation
4. Trip distribution
5. Evacuation road network preparation
6. Trip assignment and critical link identification
7. Estimates of clearance time

These seven tasks and their resulting work products are described in the following paragraphs.

Dwelling Unit Data Compilation

One of the greatest improvements over the 1989 analysis effort compared to this update was in the reliability and detail of needed socioeconomic data by subarea of the Keys. Price-Waterhouse was retained by Wallace, Roberts, & Todd to

developed detailed estimates of current land use using the recently released 1990 Census. Specifically, the following sources of data were developed and provided by Price Waterhouse through Barton-Aschman to PBS&J:

* 1990 Resident Population and Housing Units by Key Name, Planning Area/Enumeration District (PAED) and Key Division
* Unincorporated Monroe County 1990 Resident Population by PAED Districts
* Planning Area/Enumeration District (PAED) zone boundaries
* Total Occupied Housing Units by Key Name, and Key Division
* Hotel/Motel Distribution by Tourist Development Council District
* Campground/RV Park Distribution by Tourist Development Council District
* Vacation Rental Distribution by Tourist Development Council District
* Seasonal Population Projections - Unincorporated Monroe County 1990-2010 by PAED Districts and for Incorporated Monroe County 1980-2010 in total

Other sources of data obtained and considered in developing needed dwelling unit and socioeconomic parameters included:

* Monroe County Statistical Abstract 1991, Brooks White, Editor
* 1990 Florida Statistical Abstract (Table 2.36 Mobile Home and Recreational Vehicle Tags: Number sold in the State and Counties of Florida)

Based on these key data sources, the 1990 permanent population is 78,024 in Monroe County and resides in 33,583 dwelling units. The estimated peak season additional population is approximately 56,643 people and includes population in seasonal households, tourist facilities, live-aboard vessels, and the home of a friend or relative. The estimated number of seasonal housing units is 13,701 and includes hotel/motel units, campground/RV park spaces and vacation rental units. An estimated 2,600 mobile homes that houses permanent population was incorporated

into the data based on the 1990 Florida Statistical Abstract. However, it should be noted that while there is not a particularly reliable source at present for this piece of data, it is a subset of the occupied dwelling unit figure developed by Price Waterhouse for each subarea. Table 1 provides the key dwelling unit data by the seven evacuation zones used in the 1989 study and setup for Monroe County by county emergency management staff.

TABLE 1
1990 Population and Dwelling Unit Data
by Evacuation Zone

Evacuation Zone	1990 Perm. Pop.	Occupied Dwelling Units	Permanent Mob. Homes	Seasonal Units
1	32,479	13,300	857	5,510
2	10,418	4,515	151	1,649
3	12,250	5,448	326	2,849
4	2,715	1,378	124	2,019
5	6,978	3,076	1,018	486
6	11,397	5,020	124	888
7	1,787	846	0	300
Totals	78,024	33,583	2,600	13,701

Appendix A provides the computerized PAED data by PAED and then compiled for each evacuation zone. Dwelling unit columns on each sheet show total occupied dwelling units, permanent mobile homes, and seasonal dwelling units.

Storm Intensity Selection and Evacuation Zone Delineation

In the 1989 hurricane work, six major storm scenarios were developed based on whether the hurricane was a Saffir-Simpson Category 1-2 or Category 3-5 storm and whether a partial or total evacuation emphasis was communicated to Monroe County citizens. For purposes of this present update analysis, the benchmark storm scenario analyzed is a Category 3-5 hurricane with all areas of the Keys responding to evacuation advisories or orders.

A series of zones was established in the 1989 analysis based on the current zone system being used by Monroe County Emergency Management. This set of evacuation zones has been adopted for this update analysis and is described as follows:

Lower Keys
Zone 1 - Key West through Shark Key
Zone 2 - Saddlebunch Keys to 7 Mile Bridge

Middle Keys
Zone 3 - 7 Mile Bridge through Conch Key

Upper Keys
Zone 4 - Long Key through Islamorada
Zone 5 - Windley Key through Milemarker 94
Zone 6 - Milemarker 94 up to Ocean Reef area
Zone 7 - Ocean Reef Club and surrounding area

Behavioral Analysis and Trip Generation

As a part of the Corps of Engineers 1989 study effort, Carnot Nelson of the University of South Florida was hired by the Jacksonville District Corps to gather detailed information through a behavioral analysis of the evacuating population in Monroe County. The work by Dr. Nelson surveyed Keys residents and examined potential participation and evacuation response rates, destination desires, and vehicle usage.

The transportation analysis performed by PBS&J for the 1989 effort relied heavily on Dr. Nelson's findings with important input from Monroe County Civil Defense staff in assessing the applicability of the behavioral data to each storm scenario. Those behavioral parameters previously developed have been adopted for use in this update analysis.

In developing the number of people and vehicles that will be involved in an evacuation, there are several behavioral aspects that must be included:

* occupancy of tourist units
* participation rates
* destination desires/percentages
* vehicle usage

As a hurricane approaches the study area, the number of seasonal residents who may be required to evacuate along with the permanent residents could be significant. Discussions at workshop meetings with disaster preparedness officials along the eastern seaboard have revealed a number of varying opinions regarding this issue. Some individuals feel strongly that most tourists will leave prior to the start of an evacuation. Others feel that tourists might take a "wait and see" attitude, resulting in a significant number of tourists present at the start of an evacuation. In Monroe County, the 1989 study participants felt that most tourists would leave the county during an evacuation.

At present there is not a comprehensive, reliable estimate of seasonal occupancy for sub-areas of the Keys by month of the year. However, we know that based on traffic count information, the peak season of the year does not coincide with the hurricane season. In examining hotel occupancy rates for Key West during the hurricane season, we find that the rates vary between 60% and 76% with the average just over 70%. Participants in the 1989 study felt that 75% would be a maximum extreme to test in the transportation analysis regarding seasonal occupancy throughout the keys. They suggested that a 45% level be tested as a lower planning figure based on their knowledge of conditions during the hurricane season. For purposes of this comprehensive planning analysis, both 45% and 75% were tested as to their affect on clearance time.

Another important behavioral aspect is that of participation rates. Several elements were employed in the transportation analysis regarding participation in the evacuation. Based on Carnot Nelson's behavioral analysis of evacuation rates by household, participation rates were varied by evacuation area. The specific figures were as follows:

Category 3-5 Hurricane	Lower Keys	95% of mobile homes and 60% of other units
	Middle Keys	95% of mobile homes and 80% of other units
	Upper Keys	95% of mobile homes and 85% of other units

Participation rates by seasonal units were assumed to be at the 95% level similar to the mobile home participation rates. Based on Dr. Nelson's work and input from local officials during the 1989 study, these are considered to be the maximum participation levels that would ever be experienced in an evacuation assuming aggressive evacuation instructions were given to all Key's residents.

The percentage of evacuees assumed to go to one of four general destination types was another important behavioral input to the transportation analysis. In a category 3-5 hurricane, current Monroe County policy is that no suitable public shelters exist in the county and therefore none will be opened. This means that evacuees will need to go out of Monroe County to find acceptable public shelters and safe destinations such as hotel/motels or the home of a friend or relative. In Dr. Nelsons behavioral surveys, even after stating the county's policy on public shelters to the interviewee, some residents (particularly from the Lower and Middle keys) insisted that they would go to the home of a friend or relative in Monroe County or would find a last minute "public refuge". For purposes of this analysis the following destination percentages were used.

		% of evacuees to Monroe Public Shelter	% to Monroe Motel/Friends Home	% of evacuees to out of county
Category 3-5 Hurricane	Lower Keys	5%	5%	90%
	Middle Keys	5%	5%	90%
	Upper Keys	0%	0%	100%

A final behavioral assumption refers to vehicle usage and the percent of households expected to pull a trailer or recreational vehicle during an evacuation. Vehicle usage refers to the percent of vehicles available at the home origin that are assumed to be used in the evacuation. From Dr. Nelson's behavioral work we would expect a 69%, 70% and 71% vehicle usage rate for the Lower, Middle, and Upper Keys respectively. The percent of households expected to pull a boat, trailer, or RV would be 4%, 5%, and 10% for the Lower, Middle, and Upper Keys respectively. It should be noted that current Monroe County policy prohibits the movement of high profile vehicles such as RV's late in an evacuation due to wind vulnerability.

Using each of the assumptions discussed above, total evacuating people and vehicles produced by each zone were calculated and split by destination type (i.e. local public refuge, local home of a friend or relative, out of county). This was accomplished for the 45% and 75% levels of seasonal occupancy. These trip generation tables and input assumptions are provided in Appendix B.

Using the data provided in Appendix B a persons per evacuating vehicle figure can be determined for each sub-area of the Keys by seasonal scenario:

Category 3-5 Hurricane - 45% Seasonal Occupancy

Lower Keys

$$\frac{\text{36,066 people evacuating}}{\text{15,910 vehicles}} = \text{2.27 people per evacuating vehicle}$$

Middle Keys

$$\frac{\text{13,265 people evacuating}}{\text{6,510 vehicles}} = \text{2.04 people per evacuating vehicle}$$

Upper Keys

$$\frac{\text{31,124 people evacuating}}{\text{13,868 vehicles}} = \text{2.24 people per evacuating vehicle}$$

Category 3-5 Hurricane - 75% Seasonal Occupancy

Lower Keys
$\frac{42,387 \text{ people evacuating}}{17,374 \text{ vehicles}} = 2.44$ people per evacuating vehicle

Middle Keys
$\frac{15,498 \text{ people evacuating}}{7,107 \text{ vehicles}} = 2.18$ people per evacuating vehicle

Upper Keys
$\frac{38,721 \text{ people evacuating}}{14,690 \text{ vehicles}} = 2.64$ people per evacuating vehicle

Trip Distribution

Since 90 to 100% of evacuees are expected to go out of Monroe County in a Category 3, 4, or 5 hurricane, trip distribution became a matter of simply matching up expected evacuating vehicles produced by an evacuation zone with the expected point of exit for that same zone. Since US 1 and Card Sound Road are the only escape routes, this greatly simplified the task. The only complicating factor was that with a small portion of the Lower and Middle keys evacuees going to in county friends/relative's homes and in-county "public refuges", these vehicles were "distributed" to population centers or public shelters in or near those particular evacuation zones.

Appendix C provides total triptables for each seasonal scenario. These tables show all zone to zone and zone to external station vehicle movements for the 45% and 75% seasonal levels.

Evacuation Road Network Preparation

A group of assumptions important to the transportation analysis is related to the roadway system chosen for the evacuation network. Unlike most other hurricane evacuation study areas of the country, Monroe County has only two evacuation routes - US 1 and Card Sound Road linking the Keys to the mainland.

In order to develop the paths (routing) from one zone to another a type of "link-node" system was developed to identify roadway sections. Figures 1 and 2 illustrate the coded evacuation road network and zone system set up for the lower and middle, and upper keys areas respectively. Nodes are used to identify key intersections, traffic loading points, or places where major changes in roadway

characteristics take place. Links are the roadway segments between nodes. Each link is identified by a letter. Links A to Q are northbound lanes of US 1 from Key West to MM 106. Links AA to QQ are southbound lanes of US 1 from Key West to MM 106. The network was set up specifically to be able to test potential road segment improvements as to clearance time impacts and to accurately reflect levels of evacuating traffic loading the network from individual sub-areas of each evacuation zone.

Using the most current roadway characteristics data provided by Barton-Aschman, and using the 1985 Highway Capacity Manual (chapters on two-lane highways and multilane highways), link characteristics were specified. Specifically for each link, number of travel lanes and type of facility were listed and a directional service volume (at Level of Service D) calculated using procedures outlined in the Highway Capacity Manual. Appendix D provides the link file developed for the coded network and shows by link, facility type, number of lanes and hourly directional service volume.

It was assumed that special manpower (local sheriff deputies/police, state highway patrol, etc.) will be assigned to signalized intersections in the study area. This potentially would allow for smoother traffic flow and would allow northbound traffic movements more intersection "green time". The transportation analysis also assumes that provisions would be made for removal of vehicles in distress during the evacuation.

Another important assumption for the transportation modeling was that all bridges would remain open to vehicular traffic during a Hurricane Warning period. U.S. Coast Guard regulation 33-117.1(c) may give emergency management authorities the ability to implement this procedure. At the present time, request for closure prior to a major disaster occurring (and prior to the warning period) must be directed to the Coast Guard. The Coast Guard, however, has the capability of acting on these requests immediately. It is essential that appropriate bridge regulations be interpreted and implemented to allow for immediate response to an evacuation order. It may be prudent in some areas for boat owners to find safe harbor prior to or during a Hurricane Watch period. The lives of citizens evacuating in vehicles could be at greater risk if bridges are not allowed to operate at full capacity during a Hurricane Warning. Bridge openings obviously result in less than full hourly capacity for vehicular movement.

A final assumption concerning the road network are that all vehicles will evacuate prior to the arrival of sustained tropical storm winds and storm surge inundation.

Trip Assignment and Critical Link Identification

Trip assignment focused on the placement of evacuation trips contained in a trip table for a particular seasonal scenario onto the roadway links included in the coded evacuation network. Before using the assignment program, trip paths were developed for each zone to zone and zone to external station location (US 1 and Card Sound Road exit points). The computerized path file is provided in Appendix E and shows for each relevant zone to zone pair, the series of links that would be used to service vehicle trips "produced" by the first zone and "attracted" to the second zone (or external station).

As a part of the comprehensive planning hurricane analysis, PBS&J was asked to consider several scenarios related to a widened US 1. In the traffic assignments, link by link directional service volumes were modified to reflect the following test scenarios:

	Outbound Travel Lanes					
Roadway Section	Existing	Alt1	Alt2	Alt3	Alt4	Alt5
US 1 (18 Mile Stretch)	1	2	2	2	2	2
Card Sound Road	1	1	1	1	1	1
US 1 (MM 80-MM90)	1	1	2	2	2	2
US 1 (MM 73-MM80)	1	1	1	2	2	2
US 1 (MM 54-MM73)	1	1	1	1	2	2
US 1 (MM 4 -MM54)	1	1	1	1	1	2

Using the PBS&J hurricane evacuation assignment program, zone to zone vehicle trips were loaded onto the path file. This was accomplished for both levels of seasonal occupancy and for the existing as well as five widened US 1 network alternatives. This resulted in twelve assignment tables which are presented in Appendix F. For each assignment table, links are listed in alphabetical order with their associated evacuation traffic, directional service volume, and a ratio calculated by dividing the traffic volume by the service volume.

By examining the calculated ratios by link for each assignment, one can determine the most congested link or links for a particular seasonal level and widened US 1 alternative. The most congested roadway segment by widened US 1 alternative is consistent no matter which level of seasonal occupancy is assumed. However, the controlling roadway segment for the evacuation shifts depending on the widened US 1 alternative as follows:

Road Network Assumption	Controlling Roadway Segment (Most Congested Segment)	Link Name
Existing Network	US 1 - 18 mile stretch	R
Existing Network - 40% diversion to Card Sound Road	US 1 from MM80 to MM90	M,N
Widened US 1 Alt 1	US 1 from MM80 to MM90	M,N
Widened US 1 Alt 2	US 1 from MM100 to MM106	Q
Widened US 1 Alt 3	" " " " " "	Q
Widened US 1 Alt 4	" " " " " "	Q
Widened US 1 Alt 5	" " " " " "	Q

It has been suggested that the county would be willing and able to place appropriate traffic control to divert approximately 40% of northbound US 1 evacuating vehicles to Card Sound Rd. with the diversion occurring at Milemarker 106. Previous analyses by PBS&J indicated that this measure would be needed to reduce existing clearance times below the 30 hour mark. If we assume a 40% diversion of evacuation zones 1-6 traffic to Card Sound Road, then the most congested roadway segment for the existing network shifts from the 18-mile stretch to US 1 from Milemarker 80 to Milemaker 90 (links M,N). This is true for both levels of seasonal occupancy. Assuming the 40% diversion to Card Sound Road or the four laning of the eighteen mile stretch, the critical road segment moves to MM100 to MM106 when four lanes are provided between MM80 and MM90. The segment between MM100 and MM106 is already four lanes.

Estimates of Clearance Time

The most important product of this hurricane evacuation transportation analysis is the clearance times which vary by widened US 1 alternative and by seasonal occupancy level. Clearance time is one of two major considerations involved in issuing an evacuation advisory. The other is prelandfall hazards time which relates to the time before eye landfall at which we expect sustained tropical storm winds. Clearance time must be weighed with respect to the arrival of sustained tropical storm winds to make a prudent evacuation decision.

An important factor in calculating clearance time that must be considered for the transportation analysis is the response rate of the evacuating population. Behavioral data from research of past hurricane evacuations show that mobilization and actual departures of the evacuating population can occur over a period of a few hours and

sometimes over several days depending on the storm situation. For the Monroe County 1989 study effort, clearance times were tested for four evacuation rates represented by four different behavioral response curves. Behavioral response curves describing mobilization by the vulnerable population define the rate at which evacuating vehicles load onto the evacuation street network for each hourly interval relative to a strong evacuation advisory. The percentage of evacuees leaving dwelling units is then available for the calculations relating to traffic loadings at critical links along the evacuation network. In general, the quicker the response rate the shorter the clearance time. For this comprehensive planning analysis, a medium response rate was selected and corresponds to a seven hour long mobilization/loading time.

For each seasonal scenario, the number of evacuating vehicles from each area of the Keys using the critical link was identified. Evacuating vehicles from each origin-zone were then released to the critical link in accordance with the previously mentioned behavioral response curve. Based on the directional service volume established for the critical link, the hour by hour vehicle demand desiring to use the link was then translated into a number of hours to clear the link. The number of hours to clear the link included time required by zonal vehicles to get to the link based on an arrival offset for each area of the Keys. Added to this number of hours to clear the link was the estimated time it would take the last vehicle using the link to get through the 18 mile stretch. The sum was considered to be the clearance time for that particular scenario.

In addition to the evacuating vehicles expected at critical roadway segments, a measure of background traffic was added in based on recent traffic count data provided by Barton-Aschman. Background traffic includes any vehicle movements on the roadway that are not people already evacuating. This includes any people who may have come from other southeast Florida counties to secure homes in the Keys. PBS&J has hypothesized and applied the principle (from many other hurricane evacuation studies) that background traffic will begin and taper off at a rate just the opposite of the rate of evacuee response indicated by a cumulative behavioral response curve. In other words, background traffic could be quite heavy at the start of an evacuation but taper off as more and more evacuees enter the road network. It is also hypothesized (and applied) that the maximum starting level for background traffic at a given location would be the normal peak hour directional traffic volume experienced on a daily basis. These principles were applied at each critical roadway segment where clearance times were developed. Appendix G provides the clearance time calculation sheets for each tested scenario.

Table 2 provides the clearance times developed for each seasonal occupancy level and roadway assumption. Table 3 is provided as a summary of many of the key parameters discussed within this technical memorandum.

The updated clearance times from this study are generally very close to the times calculated in the 1989 work effort by PBS&J for the US Army Corps of Engineers. However, one notable exception is for the times associated with links M and N (widened US 1 Alternative 1) where the two lane section of US 1 south of Tavernier is the controlling roadway segment. Times for the 45% and 75% seasonal occupancy levels are approximately 2¾ and 4 hours less (respectively) than in the 1989 study. Three primary reasons were discovered:

1) The 1989 estimated occupied dwelling unit and population figures for Key West were much too high compared to the 1990 Census information and population data base developed by Price Waterhouse for this analysis. Accordingly, the occupied dwelling unit figures used in 1989 were too low for Key Largo compared to the new analysis data. The effect is that there are fewer vehicles traveling through this critical link from the Lower Keys than in the 1989 clearance time estimates.

2) The directional hourly service volume assumed for this roadway segment was 1,065 vehicles per hour in the 1989 work effort. The figure developed for the current analysis was 1,145 vehicles per hour and was based on much better roadway characteristics data from FDOT and provided by Barton-Aschman. The previous traffic volume was a more generalized number that was to represent traffic flow on US 1 from Key Colony Beach to Tavernier. The new figure is tailored to the physical and traffic characteristics of US 1 from Upper Matecumbe to Tavernier.

3) The background traffic figure added into the 1989 study analysis is a two way volume. The current volume for the comprehensive planning process is a directional background figure based on 1990 AADT, peak hour trips and directional percentages provided to PBS&J (from FDOT counts) by Barton-Aschman Associates, Inc.

TABLE 2

CLEARANCE TIME CALCULATIONS
Monroe County Comprehensive Plan
Hurricane Evacuation Analysis

	Baseline Assumption 45% Level-Seasonal Occupancy	Increased Population 75% Level-Seasonal Occupancy	Critical Roadway Segment
No Diversion of Evacuation Zones 1-6 Traffic to Card Sound Road			
Existing Network	35	37¾	link R
Widened US 1 Scenario 1	24¾	27	links M,N
Widened US 1 Scenario 2	22¼	24	link Q
Widened US 1 Scenario 3	22¼	24	link Q
Widened US 1 Scenario 4	22¼	24	link Q
Widened US 1 Scenario 5	22¼	24	link Q
40% Diversion of Evacuation Zones 1-6 Traffic to Card Sound Road			
Existing Network	24¾	27	links M,N
Widened US 1 Scenario 1	24¾	27	links M,N
Widened US 1 Scenario 2	22¼	24	link Q
Widened US 1 Scenario 3	22¼	24	link Q
Widened US 1 Scenario 4	22¼	24	link Q
Widened US 1 Scenario 5	22¼	24	link Q

Notes: See attached sheet which provides key assumptions for each clearance time calculation scenario.

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TABLE 3

KEY HURRICANE EVACUATION ANALYSIS ASSUMPTIONS
Monroe County Comprehensive Plan

1990 Population - 78,024
Additional Seasonal Population at Peak Season - 56,643

Assumed Storm - Category 3-5 Hurricane with all areas of the keys responding to a strong evacuation advisory. For the baseline assumption run this generates 80,456 evacuees of which 76,805 go out of Monroe County in 34,356 vehicles. For the increased population run this generates 96,606 evacuees of which 92,955 go out of Monroe County in 37,239 vehicles. (All evacuees assumed to go out of county except for a small portion of lower and middle keys evacuees seeking a last minute refuge or the home of a friend or relative.)

	Clearance Time Calculation Scenarios						
	Test 1 Baseline Assumption	Test 2 Increased Population	Widened U.S. 1 Scenarios				
			Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Percent of Peak-Season Tourist Population	45%	75%	45% + 75%	45% + 75%	45% + 75%	45% + 75%	45% + 75%
Participation Rate for Occupied Seasonal Units & Mobile Homes	95%	95%	95%	95%	95%	95%	95%
Participation Rate for other Residential Units							
· Lower Keys	60%	60%	60%	60%	60%	60%	60%
· Middle Keys	80%	80%	80%	80%	80%	80%	80%
· Upper Keys	85%	85%	85%	85%	85%	85%	85%
Response Rate	Med. Level	Med. Level	Med. Level	Med. Level	Med. Level	Med. Level	Med. Level
Outbound Travel Lanes							
U.S. (18-Mile Stretch)	1	1	2	2	2	2	2
Card Sound Road	1	1	1	1	1	1	1
U.S. 1 (MM80-MM90)	1	1	1	2	2	2	2
U.S. 1 (MM73-MM80)	1	1	1	1	2	2	2
U.S. 1 (MM54-MM73)	1	1	1	1	1	2	2
U.S. 1 (MM4-MM54)	1	1	1	1	1	1	2

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Appendix B

INITIAL REVIEW AND ASSSESSMENT

Post Hurricane Andrew Assessment of Dade County Hurricane Evacuation Technical Data and Recommendations of Contingency Procedures in the event of another storm threat.

Prepared by
U.S. Army Corps of Engineers
for
Federal Emergency Management Agency
Mission Assignment #13:R-COE-SAD-06

25 SEPTEMBER 1992

Chapter One

INTRODUCTION

PURPOSE

The purpose of this report is to present findings of a quick review and analysis of the current conditions in Dade County concerning hurricane response assumptions and several recommendations for dealing with another storm during the 1992 hurricane season.

AUTHORITY AND FUNDING

The U.S. Army Corps of Engineers (Corps) prepared this report under Mission Assignment # 13:R-COE-SAD-06, at the request of the Federal Emergency Management Agency (FEMA). FEMA requested this assessment pursuant to the provisions of The Stafford Act, PL 93-288 as amended by PL 100-707; Executive Order 12148 and Title 44, Code of Federal Regulations, Subpart A Section 206.34, Section 206.8, and Subpart G, Section 206.208. The Dade County Director of Emergency Management, in conjunction with the State of Florida, Department of Community Affairs, Division of Emergency Management, requested FEMA to assess current data and procedures and make recommendations for 1992 hurricane season evacuation contingency plans. This report was funded by Disaster Assistance funds [FEMA-0955-DR-FL].

BACKGROUND

The current version of the Hurricane Procedure (Procedure) section of the Metropolitan Dade County Emergency Operations Plan was distributed in May 1991. The primary focus of the Procedure is the protection of Dade County residents from the hazards of hurricanes. It is designed to prevent loss of life by moving residents from vulnerable areas to safer areas and shelters. The Procedure contains data from the Lower Southeast Florida Hurricane Evacuation Study, Technical Assessment for Dade County (Technical Assessment) and storm surge information produced by the 1990 Biscayne Bay SLOSH Model (Sea, Lake and Overland Surge from Hurricanes).

The Technical Assessment, using the SLOSH data as one of its bases, quantifies the major factors involved in hurricane evacuation decision-making. These data were derived in the study through several related analyses concerning vulnerability of the population, public response to evacuation advisories, timing of evacuations, and sheltering needs for various hurricane threat situations.

The Procedure apparently worked well during the approach of Hurricane Andrew. The Center for Disease Control reports that fourteen deaths were directly attributable to Andrew. "Because of the minimal storm surge in the heavily populated areas, a building code that requires structures to withstand winds of 130 mph, and advanced warning systems and well-coordinated evacuation plans, drowning as well as deaths from other causes attributed to the hurricane remained relatively low."[1]

THE CURRENT SITUATION

Demographics and previous assumptions about human behavior were abruptly altered in southeast Florida on the morning of August 24, 1992. Hurricane Andrew redistributed a portion of the population and convinced hundreds of thousands that, if faced with another hurricane threat, evacuation is the only appropriate action. Informal comments by the sensitized citizenry overwhelmingly indicate that the approach of another hurricane may trigger a mass exodus. Unless carefully planned and controlled, the situation could escalate to chaotic proportions, resulting in grave danger to thousands of vulnerable evacuees.

[1] Center for Disease Control, Morbidity and Mortality Weekly Report, September 4, 1992/Vol. 41/No. 35

CATEGORY 2-3

SCENARIO	TOTAL EVACUATING POPULATION	PUBLIC SHELTER DEMAND	OUT OF COUNTY EVACUEES	TOTAL EVACUATING VEHICLES	OUT OF COUNTY VEHICLES
NORMAL OCCUPANCY					
Original participation	408,740	47,020	120,155	172,350	49,345
Post-Andrew-25%*	774,245	73,170	374,685	335,670	163,565
Post-Andrew-50%*	1,154,980	111,245	565,730	505,790	248,890
NOVEMBER OCCUPANCY					
Original participation	444,275	50,575	145,030	187,075	59,650
Post-Andrew-25%*	812,670	77,020	401,580	351,510	174,655
Post-Andrew-50%*	1,196,420	115,390	594,730	522,800	260,795

*NON-SURGE POPULATION

CATEGORY 4-5

SCENARIO	TOTAL EVACUATING POPULATION	PUBLIC SHELTER DEMAND	OUT OF COUNTY EVACUEES	TOTAL EVACUATING VEHICLES	OUT OF COUNTY VEHICLES
NORMAL OCCUPANCY					
Original participation	589,155	75,185	208,610	252,790	87,340
Post-Andrew-25%*	905,820	86,330	534,080	394,330	233,280
Post-Andrew-50%*	1,242,700	120,015	736,430	544,900	323,700
NOVEMBER OCCUPANCY					
Original participation	628,690	79,140	236,275	269,060	98,730
Post-Andrew-25%*	947,240	90,475	563,070	411,330	245,180
Post-Andrew-50%*	1,286,130	124,760	766,830	562,680	336,150

*NON-SURGE POPULATION

CLEARANCE TIMES

In considering the evacuation that took place for Andrew and potential evacuations that could take place late in the 1992 hurricane season, it is evident that the Florida Turnpike and

I-95 will be the most critical roadway segments and therefore the controlling factors in calculating clearance time. With this in mind, clearance times were recalculated using the new Dade County estimates of people and vehicles leaving the area and using increased aggregated figures for Monroe, Broward and Palm Beach Counties out of county evacuee totals.

Table 2-3 provides the clearance times calculated in the original study as well as new clearance times based on increased participation rates. Times are stratified by storm category, participation rate assumption, rate of response and seasonal occupancy. As one would expect, times increase dramatically, sometimes more than double the original study estimates. Worst case clearance times range up to 94 1/2 hours. The implication of a clearance time this high is that people would have to start leaving four days before the arrival of a hurricane. If evacuation for a Category 4-5 hurricane was to start only two days in advance many people would simply not be physically able to leave the area. Therefore the testing of participation levels higher than 50% of non-surge zone residents becomes a moot point.

NOTE

One strategy that has been suggested is to reverse one southbound lane on the Florida Turnpike so that there would be at least three lanes northbound from Palm Beach County to Orlando. If this could be implemented, a savings in clearance time of roughly 25% to 30% would be realized for southeast Florida. This would be a significant savings in time but still would leave times as high as 62 hours.(See Chapter 4, recommendation No. 2)

CATEGORY 2-3

PARTICIPATION RATES	SUMMER SEASONAL OCCUPANCY	LATE FALL/NOVEMBER OCCUPANCY
ORIGINAL ASSUMPTIONS		
Rapid Response	24¼	29
Medium Response	24-3/4	29¼
Slow Response	25¼	30
POST-ANDREW - 25% (Non-surge population)		
Rapid Response	45-3/4	50-3/4
Medium Response	46	51¼
Slow Response	46½	51-3/4
POST-ANDREW - 50% (Non-surge population)		
Rapid Response	60¼	66½
Medium Response	60½	67
Slow Response	61	67½

CATEGORY 4-5

PARTICIPATION RATES	SUMMER SEASONAL OCCUPANCY	LATE FALL/NOVEMBER OCCUPANCY
ORIGINAL ASSUMPTIONS		
Rapid Response	36½	41¼
Medium Response	37	41-3/4
Slow Response	37½	42¼
POST-ANDREW - 25% (Non-surge population)		
Rapid Response	70½	79½
Medium Response	71	79-3/4
Slow Response	71½	80½
POST-ANDREW - 50% (Non-surge population)		
Rapid Response	87	93¼
Medium Response	87¼	93-3/4
Slow Response	87-3/4	94¼

NOTE

to participate with Dade County to ensure sufficient shelters and mass care capability.

Recommended Implementing Agency:
Dade County OEM
American Red Cross

10. LOCAL MEDIA CAMPAIGN TO EDUCATE PUBLIC REGARDING HURRICANE EVACUATION SITUATION

The public must be educated about the need for early evacuation and household plans given another threat. New clearance times for another major storm suggest that, based on expected increases in participation rates, people would need to start leaving southeast Florida up to four (4) days in advance. For another storm such as Andrew people would have to start leaving while the storm is more than a thousand miles away, at a point when track and intensity forecasts for the Miami area would be very uncertain (Andrew did not become a hurricane until two days before striking south Florida).

Recommended Implementing Agency:
Dade County OEM

11. TARGET SPECIAL POPULATION GROUPS

It is recommended that evacuation plans be communicated to migrant workers, Haitian refugees, etc, as soon as possible, utilizing relief organizations currently assisting these groups.

Recommended Implementing Agency:
Dade County OEM
Various Relief Organizations

ZONING DEFINITIONS - IMPROVED SUBDIVISIONS (IS)

IMPROVED SUBDIVISIONS (IS): TO ACCOMMODATED THE LEGALLY VESTED RESIDENTIAL DEVELOPMENT RIGHTS IN SUBDIVISIONS, INCLUDING:

DETACHED DWELLINGS OF ALL TYPES
(M) MASONRY DESIGNATION, IE: IS-M
(D) DETACHED DWELLINGS DESIGNATION, IE: IS-D
(D) DUPLEXES DESIGNATION, IE: IS-D
HOME OCCUPATIONS
ACCESSORY USES

THE OWNER OF A LOT IN AN IMPROVED SUBDIVISION MAY DEVELOP A SINGLE FAMILY DETACHED DWELLING ON A LOT, PROVIDING THAT:

A. THE LOT HAS SUFFICIENT LAND AREA FOR ON-SITE A WASTE-WATER TREATMENT SYSTEM

B. LOT IS A LAWFULLY BUILDABLE LOT ELIGIBLE FOR BUILDING PERMIT

C. THE DWELLING CONFORMS TO ALL OTHER REQUIREMENTS OF LAND USE PLAN

** <u>MAJOR CONDITIONAL USES INCLUDE:</u>

COMMERCIAL RETAIL AND OFFICE
MARINAS

** PUBLIC HEARING. DECISION BY THE PLANNING COMMISSION. OPEN FOR APPEAL.

ZONING DEFINITIONS - SUB URBAN RESIDENTIAL (SR)

SUB URBAN RESIDENTIAL (SR): TO ESTABLISH AREAS OF LOW/MEDIUM DENSIT RESIDENTIAL BY USE OF SINGLE FAMILY DWELLINGS INCLUDING:

DETACHED RESIDENTIAL DWELLINGS
COMMUNITY PARKS
BEE KEEPING
HOME OCCUPATIONS
ACCESSORY USES

* <u>MINOR CONDITIONAL USES INCLUDE:</u>

ATTACHED RESIDENTIAL DWELLING UNITS
PUBLIC/PRIVATE TENNIS COURTS AND SWIMMING POOLS
PUBLIC BUILDINGS
COMMERCIAL RETAIL AND OFFICE
INSTITUTIONAL RESIDENTIAL

** <u>MAJOR CONDITIONAL USES INCLUDE:</u>

ATTACHED RESIDENTIAL DWELLING UNITS, GREATER THAN MINOR USE
INSTITUTIONAL RESIDENTIAL
MARINAS
AGRICULTURAL USES
CAMPGROUNDS
HOTELS
CLUBHOUSE/MEETING FACILITIES

MAXIMUM RESIDENTIAL DENSITY:

DWELLING UNITS PER ACRE: 1.0
DWELLING UNITS PER ACRE W/TDR (TRANSFER DEVELOPMENT RIGHTS): 10.0

MAXIMUM HOTEL/MOTEL, RV AND INSTITUTIONAL RESIDENTIAL DENSITY:

INSTITUTIONAL RESIDENTIAL UNITS PER ACRE: 3.0
HOTEL ROOMS PER ACRE: 5.0
RV AND CAMPGROUND SPACES PER ACRE: 5.0

* DECISION BY THE DIRECTOR OF PLANNING. OPEN FOR APPEAL.
** PUBLIC HEARING. DECISION BY PLANNING COMMISSION. OPEN FOR APPEAL.

ZONING DEFINITIONS - SUB URBAN COMMERCIAL (SC)

SUB URBAN COMMERCIAL (SC): TO ESTABLISH AREAS FOR COMMERCIAL USES INCLUDING

COMMERCIAL RETAIL AND OFFICE
INSTITUTIONAL RESIDENTIAL
COMMERCIAL APARTMENTS
RECREATIONAL, INCLUDING:
- BOWLING ALLEYS
- TENNIS/RACQUET BALL COURTS
- MINIATURE GOLF/DRIVING RANGES
- THEATERS
- HEALTH CLUBS
- SWIMMING POOLS

PUBLIC BUILDINGS
INSTITUTIONAL

* <u>MINOR CONDITIONAL USES INCLUDE:</u>

COMMERCIAL RETAIL AND OFFICE GREATER THAN 2,500 SQ FT
INSTITUTIONAL RESIDENTIAL GREATER THAN ABOVE
COMMERCIAL APARTMENTS GREATER THAN ABOVE
HOTELS
HELIPORTS/SEAPLANE PORTS
CAMPGROUNDS
LIGHT INDUSTRIAL

** <u>MAJOR CONDITIONAL USES INCLUDE:</u>

COMMERCIAL RETAIL AND OFFICE GREATER THAN 10,000 SQ FT
INSTITUTIONAL RESIDENTIAL GREATER THAN MINOR USE
HOTELS GREATER THAN MINOR USE
MARINAS
MARICULTURE

MAXIMUM RESIDENTIAL DENSITY:

DWELLING UNITS PER ACRE: 3.0
DWELLING UNITS PER ACRE W/TDR (TRANSFER DEVELOPMENT RIGHTS): 6.0

MAXIMUM HOTEL/MOTEL, RV AND INSTITUTIONAL RESIDENTIAL DENSITY:

HOTEL ROOMS PER ACRE: 15.0
RV AND CAMPGROUND SPACES PER ACRE: 10.0

* DECISION BY THE DIRECTOR OF PLANNING. OPEN FOR APPEAL.
** PUBLIC HEARING. DECISION BY PLANNING COMMISSION. OPEN FOR APPEAL.

ZONING DEFINITIONS - SUB URBAN COMMERCIAL (SC)

SUB URBAN COMMERCIAL (SC): TO ESTABLISH AREAS FOR COMMERCIAL USES INCLUDING:

- COMMERCIAL RETAIL AND OFFICE
- INSTITUTIONAL RESIDENTIAL
- COMMERCIAL APARTMENTS
- RECREATIONAL, INCLUDING:
  - BOWLING ALLEYS
  - TENNIS/RACQUET BALL COURTS
  - MINIATURE GOLF/DRIVING RANGES
  - THEATERS
  - HEALTH CLUBS
  - SWIMMING POOLS
- PUBLIC BUILDINGS
- INSTITUTIONAL

* <u>MINOR CONDITIONAL USES INCLUDE:</u>

- COMMERCIAL RETAIL AND OFFICE GREATER THAN 2,500 SQ FT
- INSTITUTIONAL RESIDENTIAL GREATER THAN ABOVE
- COMMERCIAL APARTMENTS GREATER THAN ABOVE
- HOTELS
- HELIPORTS/SEAPLANE PORTS
- CAMPGROUNDS
- LIGHT INDUSTRIAL

** <u>MAJOR CONDITIONAL USES INCLUDE:</u>

- COMMERCIAL RETAIL AND OFFICE GREATER THAN 10,000 SQ FT
- INSTITUTIONAL RESIDENTIAL GREATER THAN MINOR USE
- HOTELS GREATER THAN MINOR USE
- MARINAS
- MARICULTURE

MAXIMUM RESIDENTIAL DENSITY:

DWELLING UNITS PER ACRE: 3.0
DWELLING UNITS PER ACRE W/TDR (TRANSFER DEVELOPMENT RIGHTS): 6.0

MAXIMUM HOTEL/MOTEL, RV AND INSTITUTIONAL RESIDENTIAL DENSITY:

HOTEL ROOMS PER ACRE: 15.0
RV AND CAMPGROUND SPACES PER ACRE: 10.0

* DECISION BY THE DIRECTOR OF PLANNING. OPEN FOR APPEAL.
** PUBLIC HEARING. DECISION BY PLANNING COMMISSION. OPEN FOR APPEAL.

ZONING DEFINITIONS - MISCELLANEOUS

RECREATIONAL VEHICLE (RV): TO ESTABLISH AREAS FOR RECREATIONAL VEHICLE USES INCLUDING:

RECREATIONAL VEHICLE SPACES
COMMERCIAL RETAIL

* MINOR CONDITIONAL USE INCLUDES:

HOTELS

** MAJOR CONDITIONAL USE INCLUDES:

MARINAS

MAXIMUM HOTEL/MOTEL, RV AND INSTITUTIONAL RESIDENTIAL DENSITY:

HOTEL ROOMS PER ACRE: 15.0
RV AND CAMPGROUND SPACES PER ACRE: 15.0

NATIVE DISTRICT (NA): TO ESTABLISH AREAS THAT ARE UNDISTURBED, PRESERVED IN THEIR NATURAL STATE.

MAXIMUM RESIDENTIAL DENSITY:

MANGROVE AREA:
DWELLING UNITS PER ACRE: 0.0

HAMMOCK AREA:
DWELLING UNITS PER ACRE: .5
DWELLING UNITS PER ACRE W/TDR (TRANSFER DEVELOPMENT RIGHTS): 5.0

* DECISION BY THE DIRECTOR OF PLANNING. OPEN FOR APPEAL.
** PUBLIC HEARING. DECISION BY PLANNING COMMISSION. OPEN FOR APPEAL.

LOWER MATECUMBE KEY

COMMUNITY PLAN AND DESIGN GUIDELINES

SUBMITTED TO:
LOWER
MATECUMBE
PROPERTY
OWNERS

SUBMITTED BY:
LMKA
TASK
FORCE

FEB 1990

TABLE OF CONTENTS

LOWER MATECUMBE COMMUNITY PLAN LAND USE PHASE

OBJECTIVES:

THE FLORIDA KEYS HAVE BEEN DESIGNATED AN AREA OF CRITICAL STATE CONCERN BY THE STATE OF FLORIDA. AS A RESULT OF THIS DESIGNATION, MONROE COUNTY DEVELOPED A COMPREHENSIVE PLAN. THE PRIMARY OBJECTIVE OF THE PLAN IS TO CONSERVE THE NATURAL ENVIRONMENT OF THE COUNTY.

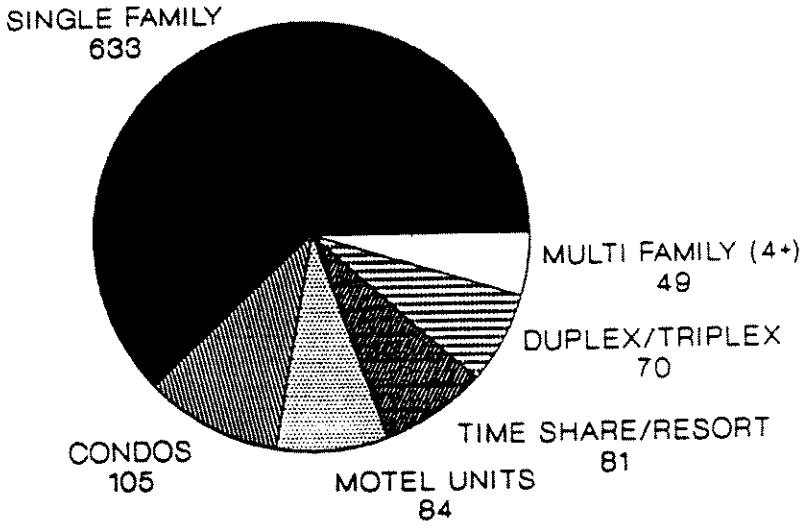
THE LOWER MATECUMBE KEY ASSOCIATION WAS FORMED NEARLY FIVE YEARS AGO BY THE CITIZENS OF THE ISLAND TO PRESERVE THE LIFE AND ENVIRONMENT OF LOWER MATECUMBE KEY. (SEE LOWER MATECUMBE KEY ASSOCIATION, STATEMENT OF PURPOSE, APPENDIX A.)

IN 1989, THE MONROE COUNTY BOARD OF COUNTY COMMISSIONERS APPROVED THE DEVELOPMENT OF A COMMUNITY PLAN FOR THE ISLAND OF LOWER MATECUMBE. THIS COMMUNITY PLAN IS NOW BEING DEVELOPED TO INCORPORATE THE GOALS OF THE CITIZENS OF THE ISLAND, THE COUNTY, AND THE STATE OF FLORIDA.

IT HAS BEEN DEMONSTRATED AT THE COMMUNITY PLAN WORKSHOPS HELD AS A PART OF THE PLANNING PROCESS, THAT AN OVERWHELMING MAJORITY OF THE CITIZENS WHO VOICED OPINIONS WANT LOWER MATECUMBE KEY TO REMAIN A PREDOMINANTLY RESIDENTIAL ISLAND WITH FUTURE DEVELOPMENT LIMITED TO SINGLE FAMILY HOMES.

KEEPING THE ISLAND A RESIDENTIAL ISLAND OF LOW DENSITY APPEARS TO BE A GOAL THAT CAN BE ACCOMPLISHED TO THE SATISFACTION OF THE CITIZENS BY LIMITING COMMERCIAL DEVELOPMENT AND MULTI-FAMILY DEVELOPMENT. IT MAY NOT BE NECESSARY TO LOWER DENSITY BY RESTRICTING BUILDING ON ALREADY PLATTED LOTS.

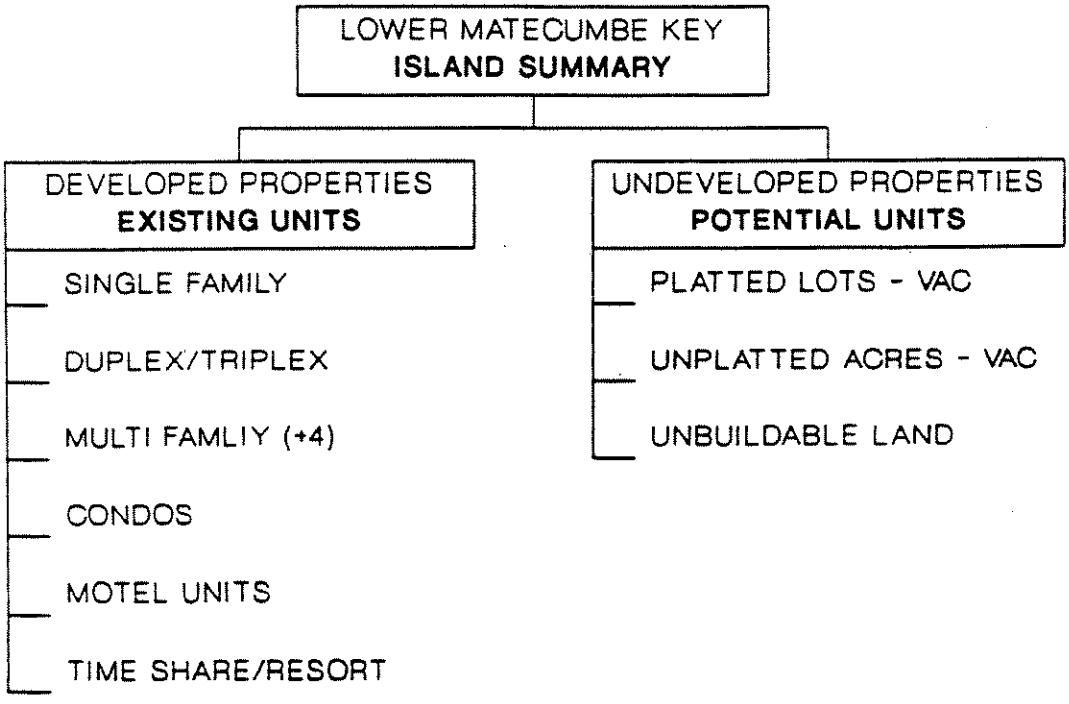
LOWER MATECUMBE DATA 1990
DEVELOPED PROPERTIES



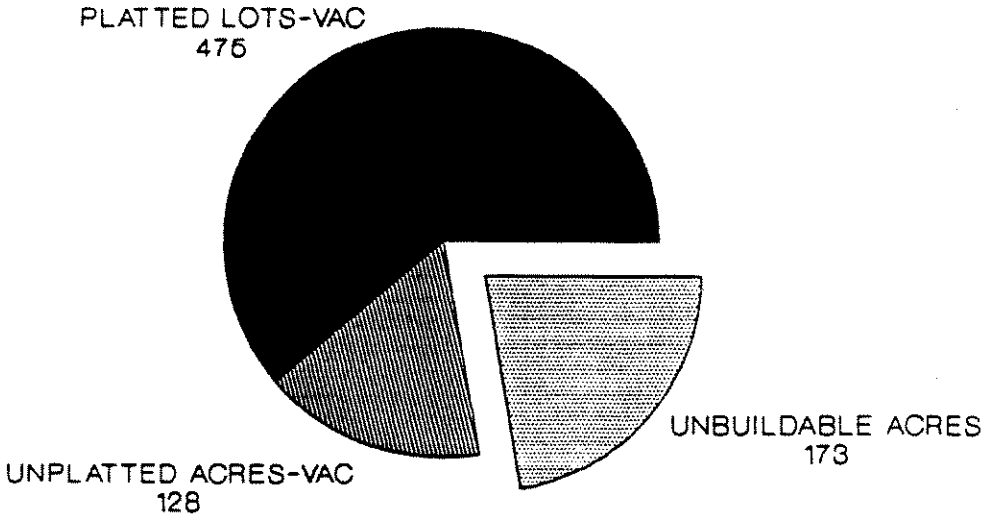
1022 TOTAL DWELLING UNITS

* SEE APPENDIX FOR STATISTICS

LOWER MATECUMBE DATA 1990



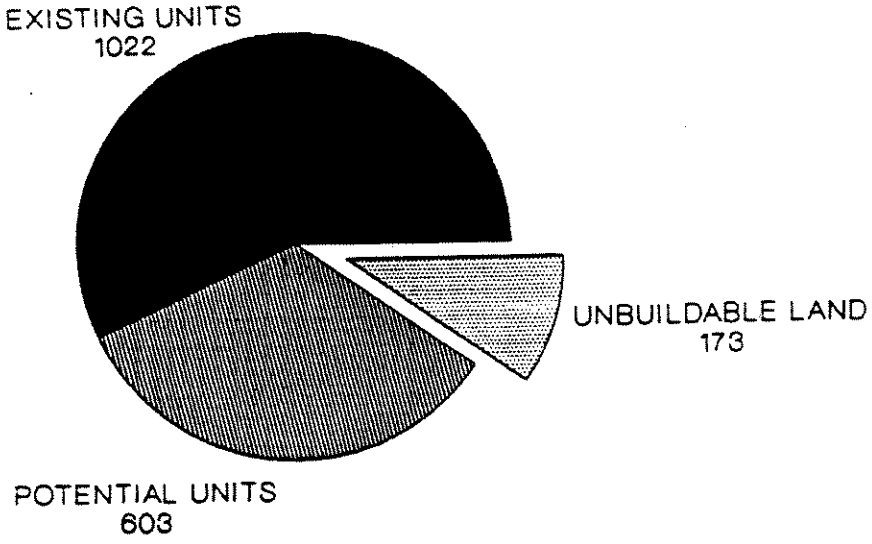
LOWER MATECUMBE DATA 1990
UNDEVELOPED SITES



603 TOTAL UNDEVELOPED SITES/DU

* SEE APPENDIX FOR STATISTICS

LOWER MATECUMBE DATA 1990
ISLAND SUMMARY - DWELLING UNITS



1625 TOTAL POTENTIAL DWELLING UNITS

IMPLEMENTATION PLAN STEPS

1. ALL RESIDENTIAL ZONING FOR LOWER MATECUMBE KEY WOULD HAVE PERMITTED USES OF RIGHT ONLY WITH NO CONDITIONAL USES. THIS COULD BE IMPLEMENTED WITH A ZONING APPENDAGE OF "R" (FOR "RESTRICTED") FOR SR, SUBURBAN RESIDENTIAL AND IS, IMPROVED SUBDIVISION, ZONING DESIGNATIONS.

   "RESTRICTED" WOULD BE DEFINED AS:

   A. LIMITED USES OF RIGHT ONLY WITH NO CONDITIONAL USES.

   B. MAXIMUM NET DENSITY AND ALLOCATED DENSITY WOULD BE EQUAL. (NO INCREASE IN DENSITY THROUGH THE USE OF TDR'S, TRANSFERABLE DEVELOPMENT RIGHTS.)

2. CHANGE ZONING OF ALL PLATTED SUBDIVISIONS TO IS-R (IMPROVED SUBDIVISION, RESTRICTED) WITH A FEW EXCEPTIONS FOR COMMERCIAL ZONING ALONG U. S. ONE. **(SEE ZONING CHANGES, PLATTED)**

3. CHANGE ZONING OF SEVERAL UNPLATTED AREAS IN AN EFFORT TO AFFORD SOME PROTECTION OF ENVIRONMENTALLY SENSITIVE LANDS. **(SEE ZONING CHANGES, UNPLATTED)**

4. ALL PROPERTIES DIVIDED PRIOR TO SEPT 15, 1986, WILL BE HONORED AS A CONFORMING BUILDING SITE, AND ZONED AS IS-R.

5. IS-R ZONING WOULD BE FURTHER DEFINED SO THAT EVERY PLATTED LOT UP TO 1 ACRE WOULD HAVE (1) DEVELOPMENT RIGHT. FOR EACH ADDITIONAL FULL ACRE, (1) DEVELOPMENT RIGHT WOULD BE ALLOCATED.

6. REDEFINE THE RIGHTS AND LIMITATIONS OF NON-CONFORMING USES. (SEE NON-CONFORMING USE.)

7. PRIORITY MUST BE PLACED ON THE NEED FOR PROPERTY ACQUISITION FOR USE FOR ANY FUTURE WASTE-WATER TREATMENT FACILITIES TO PROTECT NEAR-SHORE WATER QUALITY AND PROVIDE ADEQUATE SERVICE FOR LOWER MATECUMBE PROPERTIES ONLY.

ZONING CHANGES PLATTED SUBDIVISIONS

A. CHANGE ZONING OF ALL PLATTED SUBDIVISIONS TO IS-R (IMPROVED SUBDIVISION, RESTRICTED) WITH A FEW EXCEPTIONS FOR COMMERCIAL ZONING ALONG U. S. ONE.

B. SAFETY HARBOR AND PORT ANTIGUA WOULD HAVE THE IS-RM ZONING TO RESTRICT THE TYPE OF HOMES TO THAT OF MASONRY CONSTRUCTION.

C. THE FOLLOWING CHANGES WOULD HAVE TO BE MADE TO GIVE THE IS-R ZONING CLASSIFICATION TO THE PREDOMINANCE OF PLATTED LOTS:

1. TOLLGATE SHORES, CFSD LOTS CHANGED TO IS-R.
2. LOWER MATECUMBE BEACH, IROQUOIS DRIVE TOWNHOUSES, CHANGED FROM SC TO IS-R.
3. PORT ANTIGUA, OCEANSIDE OF EL CAPITAN, SR TO IS-R.
4. MATECUMBE SANDY BCH, SANDY COVE CONDOS FROM SC TO IS-R.
5. LOWER MATECUMBE HARBOR, TOPSIDER, GAMEFISH RESORT FROM SC TO IS-R.
6. MATECUMBE OCEAN BAY, BLOCK 2 LOTS 1-8 AND BLOCK 3 LOTS 10-38 AND LOTS 41-46, SR TO IS-R.
7. FANTASY HARBOR, SC TO IS-R.
8. MATECUMBE OCEAN VIEW BLOCK 1 LOTS 1-19 SR TO IS-R.
9. SAFETY HARBOR, BLOCK 1 LOTS 1-5, SC TO IS-R.
10. SEABASE, SC TO SR.

ZONING CHANGES UNPLATTED TRACTS

1. AREA ON NORTHEAST END OF ISLAND ALONG THE OCEAN SOUTH OF MALIBU, FROM SC TO SR-R.
2. ROBBIE'S FROM RV TO SC ALONG THE HIGHWAY WHERE EXISTING BUSINESSES ARE LOCATED, AND SR-R ON THE BAY SIDE OF PROPERTY.
3. CAPTIAN CLUB, CFD TO SR-R.

NON-CONFORMING USE REGISTRATION

ACCORDING TO SEC. 7-104. D. 2. OF THE FLORIDA KEYS COMPREHENSIVE PLAN, VOLUM III, IF MORE THAN 50% OF A NON-CONFORMING STRUCTURE IS DESTROYED, TH STRUCTURE CAN BE REPAIRED ONLY FOR USES THAT ARE CONFORMING.

SEVERAL MOTELS, MULTI-FAMILY, AND COMMERCIAL STRUCTURES HAVE ZONING IN WHICH ACCORDING TO THE CURRENT LAND USE PLAN, IT WOULD NOT BE POSSIBLE TO REBUIL IF THEY WERE DESTROYED. THESE REQUIREMENTS SHOULD BE MODIFIED TO PROTECT TH OWNERS AND AVOID INSURANCE CONFLICTS WHEN SIGNIFICANT DAMAGE OCCURS.

ALL NON-CONFORMING USES AND STRUCTURES WOULD BE REGISTERED AS ALREAD PROVIDED. THE USE INCLUDING NUMBER OF UNITS THAT EXIST WOULD BE REGISTERE SO THAT IF THE STRUCTURE(S) WERE DESTROYED REBUILDING WOULD BE PERMITTED T THE SAME DEGREE AS ORIGINALLY REGISTERED NO MATTER WHAT THE EXTENT OF DAMAGE

TIME LIMITATIONS WOULD BE ESTABLISHED SO THAT IF RECONSTRUCTION IS NOT UNDE PERMIT WITHIN 2 YEARS THE RIGHTS TO REBUILD THE STRUCTURE FOR A NON-CONFORMING USE WOULD BE FORFEITED.

PART II

COMMUNITY DESIGN GUIDELINES

LOWER MATECUMBE KEY

COMMUNITY DESIGN OBJECTIVES

IN GENERAL, PART II, "DESIGN GUIDELINES - LOWER MATECUMBE KEY" IS A GOOD BEGINNING. WE APPLAUD THE CONCEPT OF A DESIGN CORRIDOR AND A CONSISENT IMAGE FOR THE KEY. THE BY-WORD IN TODAY'S WORLD, WHETHER ONE IS REFERRING TO A MANUFACTURED PRODUCT OF A MAJOR REAL ESTATE DEVELOPMENT IS QUALITY. IT IS BELIEVED THAT AN IMAGE THROUGHOUT LOWER MATECUMBE KEY WHICH REFLECTS RESTRAINT AND DIGNITY, WILL PRODUCE A BETTER ENVIRONMENT FOR RESIDENTS AND ENHANCE BUSINESS FOR COMMERCIAL INTERESTS.

IN GENERAL, WE APPROVE WITH ONLY MINOR EXCEPTIONS, THE PORTIONS OF THE GUIDELINE FOR STREET LANDSCAPING, GENERAL LANDSCAPING, AND PARKING LOTS. MANY OF THE GUIDELINES ARE COVERED BY EXISTING COUNTY ORDINANCES, AND WE STRESS THAT AN IMMEDIATE START ON ENFORCEMENT OF THESE SHOULD BE UNDERTAKEN.

WE CONCUR WITH THE GENERAL DIRECTION OF THE GUIDELINES FOR SIGNAGE, BUT DO NOT THINK HOWEVER THAT THEY GO FAR ENOUGH TO CREATE THE QUALITY IMAGE THAT WE WISH TO PROJECT.

ACROSS THE COUNTRY, VISUAL POLLUTION IS RAMPANT ALONG THE MAIN HIGHWAYS OF SUBURBIA. EACH SIGN, BANNER, OR BALLOON TRIES TO OUT-SHOUT ITS NEIGHBOR, CREATING A CONFUSING HORROR WHICH, TOO OFTEN, WE NOW TAKE FOR GRANTED. THERE EXIST MANY MAJOR DEVELOPMENTS WHERE HIGHLY RESTRICTED SIGNAGE THAT IS UNIFORM IS SIZE, LETTERING AND MATERIALS IS APPLIED TO DIRECTIONAL SIGN, COMMERCIAL SIGN AND BUILDING IDENTIFICATION SIGNS, PROVIDING A QUALITY IMAGE.

PROPERLY EXECUTED, A TIGHTER SIGNAGE SYSTEM WILL AID MOTORISTS DRIVING THROUGH THE KEY, PROMOTE SAFETY, INCREASE BUSINESS FOR RETAIL ESTABLISHMENTS, AND ENHANCE PROPERTY VALUES FOR RESIDENTS.

WE CONCUR WITH THE PORTIONS OF THE DESIGN GUIDELINES ON LIGHTING EXCEPT FOR THE PARAGRAPHS ON BANNERS, AS BANNERS DO NOT SEEM CONSISTENT WITH THE QUALITY WE WISH TO PROJECT. AGAIN THERE ARE SOME FLOOD COUNTY ORDINANCE REGARDING LIGHTING LEVELS AND SPILL-OVER TO ADJOINING PROPERTIES THAT NEED ENFORCEMENT.

RELATIVE TO STREET FURNITURE, WE DO NOT SEE A PARTICULAR NEED FOR MAIL BOX CONSOLIDATION OR FOR NEWSPAPER KIOSKS. WE DO, HOWEVER BELIEVE THAT A UNIFORM APPROACH TO SCREENING INDIVIDUAL PROPERTY OWNER'S TRASH CANS IS IMPORTANT.

COMMUNITY DESIGN GUIDELINES

ROADWAY DESIGN:
1. PAVED BIKE PATH, 6-8 FOOT LOCATED ON THE NORTHSIDE OF FRONTAGE ROAD BIKE PATH TO CROSS U.S. ONE FROM NORTHSIDE TO SOUTHSIDE AT WEST END TO AND EXTEND ONTO MATECUMBE BEACH
2. IMPROVED FRONTAGE ROAD
3. PLANTING BUFFERS BETWEEN HIGHWAY AND FRONTAGE ROAD
4. EXPANDED HIGHWAY PLANS UNDER D.O.T. CONTROL
5. COMMUNITY REQUESTS TO BE INFORMED, WITH THE OPPORTUNITY FOR IMPUTE

LANDSCAPE GUIDELINES, PRIVATE:
1. ENCOURAGE ENFORCEMENT OF EXISTING COUNTY GUIDELINES

LANDSCAPE GUIDELINES, PUBLIC ROADWAY:
1. ENCOURAGE ENFORCEMENT OF EXISTING COUNTY GUIDELINES
2. ENCOURAGE ENFORCEMENT OF EXISTING BUFFER GUIDELINES ALONG U.S. ONE CORRIDOR

PRESERVATION OF NATURAL VEGETATION:
1. ENCOURAGE ENFORCEMENT OF EXISTING COUNTY GUIDELINES, AND SUPPORT THE IMPORTANCE OF A REVIEW BY AN ENVIRONMENTALIST

PARKING LOT LANDSCAPING:
1. ENCOURAGE ENFORCEMENT OF EXISTING COUNTY GUIDELINES
2. PARKING AREAS MUST BE SCREENED WITH LANDSCAPE BUFFER
3. INCREASE HEIGHT & DIAMETER REQUIREMENTS OF LANDSCAPE BUFFER

VISIBILITY:
1. UNOBSTRUCTED CROSS VISIBILITY MUST BE MAINTAINED

VISUAL SCREENING, PUBLIC:
1. 6' MASONRY, FENCING, OR LANDSCAPING TO SCREEN UNATTRACTIVE AREAS

VISUAL SCREENING, PRIVATE:
1. PRIVACY WALLS ALONG U.S. ONE CORRIDOR ENCOURAGED, PROVIDING ESTHETIC CONSIDERATIONS ARE ADDRESSED
2. 6' WALLS TO BE PERMITTED WITHIN ____FT FROM D.O.T. RIGHT-OF-WAY
3. TYPES TO INCLUDE: SOLID 6' WALLS, SOLID 4'/DECORATIVE 2',NATURAL VEGATATION, AND CHAIN LINK IN COMBINATION WITH NATURAL VEGATATION TO COVER CHAIN LINK ON SIDE OF HIGHWAY

ENTRANCE DEFINITION:

1. SIGNAGE AT ISLAND ENTRANCES, COORDINATED WITH COMMUNITY SIGN DESIGN (SEE COMMUNITY SIGN DESIGN)
2. NATURAL STYLE DICTATED BY LOW MAINTAINENCE REQUIREMENTS
3. ACQUISITION OF D.O.T. RIGHTWAY FOR ENTRANCE SIGNAGE

COMMUNITY SIGN DESIGN:

1. ENCOURAGE ENFORCEMENT OF COUNTY GUIDELINES
2. CREATE COMMUNITY IMAGE WITH COORDINATED PUBLIC/PRIVATE/COMMERCIAL DESIGN CONTINUITY
3. ENCOURAGE SIGNAGE ON U.S. ONE DESIGNATING SUBDIVISIONS
4. RESTRICT ALL TEMPORARY SIGNS TO MAXIMUM SIZE OF 2'X 3'

VEHICULAR & PEDESTRIAN SIGNAGE:

1. USE DIRECTIONAL AND INFORMATIONAL SIGNAGE, ACCORDING TO URBAN SYSTEMS STANDARDS
2. CONSOLIDATE SIGNAGE
3. COORIDINATE WITH COMMUNITY SIGN DESIGN
4. RESTRICT SIZE TO NO MORE THAN 3' HEIGHT, 4' SQ. TOTAL AREA

LIGHTING:

1. ENCOURAGE USE OF FIXTURES DESIGNED TO CAST LIGHT DOWNWARD
2. 5-10 YEAR COMPLIANCE FOR REPLACEMENT OF FIXTURES TO SAME
3. LIGHTING ON PRIVATE PROPERTIES SHALL NOT SPILL ONTO ADJACENT PROPERTIES
4. ENFORCE COUNTY ORDINANCES REGARDING LIGHTING OF WATERFRONT
5. CONSIDER LIGHTING NEEDS ALONG BIKE PATH

PART III

ADDITIONAL COMMUNITY CONCERNS

LOWER MATECUMBE KEY

ADDITIONAL COMMUNITY CONCERNS

WATER QUALITY

STORM WATER DRAINAGE SYSTEM:

1. CONSIDERATION OF STORM WATER RUN-OFF IN CASE OF EXPANDED HIGHWAY PROGRAM, IE: DRAINAGE WELLS

SEWAGE TREATMENT PLANS:

1. PRIORITY PLACED ON ADDRESSING FUTURE REQUIREMENTS
2. PLAN AND BUDGET FOR LAND ACQUISITION
3. FACILITIES TO SERVICE ONLY LOWER MATECUMBE PROPERTIES

CROSS ISLAND CANAL SYSTEM:

1. REOPEN ORIGINAL CANAL AT WEST END OF ISLAND, "HURRICANE CREEK", TO IMPROVE WATER QUALITY. MONITOR AS TEST PROGRAM FOR ISLAND.
2. REVIEW OTHER DESIGNATED AREAS FOR SAME.

ENVIRONMENTAL CONCERNS:

1. PRIORITY PLACED ON ADDRESSING FUTURE PROBLEMS RESULTING FROM INCREASE POPULATION/BOAT TRAFFIC
2. PROHIBIT USE OF JET SKIS WITHIN SPECIFIED BOUNDARIES OF ISLAND

APPENDIX

COMMUNITY PLAN

LOWER MATECUMBE KEY

APPENDIX A

LOWER MATECUMBE KEY ASSOCIATION

STATEMENT OF PURPOSE

THE LOWER MATECUMBE KEY ASSOCIATION, INC. SHALL ACTIVELY WORK TO PRESERVE AND ENHANCE THE QUALITY OF LIFE AND ENVIRONMENT THROUGH PARTICIPATION AND DEMOCRATIC PROCESS BY IT'S RESIDENTS.

GOALS SHALL INCLUDE:

1. MONITORING ACTIVITIES SUCH AS ZONING AND CONSTRUCTION WHICH MIGHT AFFECT THE CHARACTER AND ENVIRONMENT OF LOWER MATECUMBE KEY.

2. COMMUNICATING WITH ALL MEMBERS TO ALERT THEM TO POTENTIAL PROBLEMS OR OPPORTUNITIES WHICH MIGHT AFFECT THE QUALITY OF LIFE ON LOWER MATECUMBE KEY.

3. COORDINATING THE EFFORTS OF THE INDIVIDUAL NEIGHBORHOOD ASSOCIATIONS ON ANY COMMON OBJECTIVES WHERE A COLLECTIVE EFFORT COULD BE BENEFICIAL.

4. PROVIDING AN OPEN FORUM WHERE ISSUES AFFECTING LOWER MATECUMBE KEY CAN BE PRESENTED AND DISCUSSED.

5. TAKING APPROPRIATE ACTION ON BEHALF OF THE MEMBERSHIP TO INTERCEDE IN MATTERS FOR THE COMMON GOOD OF THE MEMBERSHIP AS DECIDED BY A MAJORITY.

LOWER MATECUMBE KEY DWELLING UNITS

SINGLE FAMILY/DUPLEX/TRIPLEX	total units single family	total units duplex/ triplex	TOTALS
Davis Shores	14	2	
Fantasy Harbour	6		
Lower Matecumbe Beach	76		
Lower Matecumbe Harbor	14	10	
Mar Celeste	16		
Mat. Ocean Bay Sec 1	32	12	
Mat. Ocean Bay Sec 2	9	2	
Matecumbe Ocean Beach	11		
Matecumbe Ocean View	37	6	
Matecumbe Sandy Beach	37	9	
Mate Lido Beach	9		
Port Antigua	184	25	
Safety Harbor	62		
Stillbeach	4		
Toll Gate Shores	38		
White Marlin Beach	83	4	
Unplatted	1		
TOTALS	633	70	703

MULTI-FAMILY (4 or more)	# of Units	
Bayside	5	
Evening Shade	15	
Barefoot Beach	12	
Morada Bay	4	
Iroquois Dr. Townhouses	8	
Lindo Mar Apts.	5	
TOTALS	49	49

CONDOMINIUMS	# of Units	TOTAL
Islamorada South (F&G)	24	
Islamorada South 3	12	
Sandy Cove	12	
Sand Glass	5	
Sandy Cove Villas	7	
Port Antigua Townhouses	18	
Sandy Point Condominiums	10	
Condo	10	
Beechwood	7	
TOTAL	105	105

MOTELS	with kitchen	rooms only	
Malibu	14	7	
Gamefish	8	8	
Tropic Aire	14	4	
White Gate	12		
Boy Scout Sea Base	3	14	
TOTALS	51	33	84

RESORT/TIMESHARE	# of Units	
Caloosa Cove	30	
Matecumbe Resort	31	
Topsider	20	
TOTALS	81	81

TOTAL DWELLING UNITS: 1022

LOWER MATECUMBE KEY VACANT PROPERTIES

		TOTAL	UNBUILDABLE	DEVELOPED	VACANT BUILDABLE
SUBDIVISION: (LOTS)	Davis Shores	22	0	15	7
	Fantasy Harbour	9	0	6	3
	Lower Matecumbe Beach	130	0	80	50
	Lower Matecumbe Harbor	30	0	22	8
	Mar Celeste	22	0	16	6
	Mat. Ocean Bay Sec 1	78	0	50	28
	Mat. Ocean Bay Sec 2	21	0	10	11
	Matecumbe Ocean Beach	21	0	12	9
	Matecumbe Ocean View	74	0	56	18
	Matecumbe Sandy Beach	64	0	47	17
	Mate Lido Beach	22	0	9	13
	Port Antigua	332	0	198	134
	Safety Harbor	113	0	62	51
	Stillbeach	12	0	4	8
	Toll Gate Shores	68	0	39	29
	White Marlin Beach	170	0	87	83
	TOTALS (PLATTED)	1188	0	713	475
TRACTS: (ACRES)	Davis Tract	5.00	0.00	0.00	5.00
	Webster Tract	70.00	70.00	0.00	0.00
	Sea Oats Beach	5.00	5.00	0.00	0.00
	Parmalee Estate	53.00	0.00	1.00	52.00
	Hall	18.00	12.00	0.00	6.00
	Thompson Coal	24.00	16.00	0.00	8.00
	Nature Conservancy	50.00	35.00	0.00	15.00
	Klopp	40.00	32.00	0.00	8.00
	Robbie's	13.00	0.00	2.00	11.00
	Siegler	6.00	0.00	0.00	6.00
	Arch Diocese of Miami	5.00	0.00	0.00	5.00
	DOT ROW Mat Bch	3.50	3.50	0.00	0.00
	State Of Florida	4.22	0.00	0.00	4.22
	Boy Scout Sea Base	3.97	0.00	3.97	0.00
	Caloosa Cove Resort	3.15	0.00	3.15	0.00
	Caloosa Cove Marina	4.10	0.00	4.10	0.00
	Captains Cove	5.60	0.00	0.00	5.60
	Captains Club	3.00	0.00	0.00	3.00
	Malibu	1.73	0.00	1.73	0.00
	TOTALS	318.27	173.5	15.95	128.82
	ISLAND TOTALS	1506	174	729	604